Palestrica of the third millennium – Civilization and Sport
Vol. 17, no. 3, July-September 2016, 185–192

ORIGINAL STUDIES
ARTICOLE ORIGINALE

Complex rehabilitation in females with fibromyalgia
Program de recuperare complex la femeile cu fibromialgie

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Abstract

Background. Fibromyalgia (FM) is one of the most common soft tissue conditions characterized by pain and associated with substantial disability. After osteoarthritis, it is the most common cause for a medical consultation.

Aims. We evaluated in our study the efficacy of a complex rehabilitation program, based on an 8 weeks home aerobic training, for reducing pain and associated symptoms and improving the quality of life in females with fibromyalgia.

Methods. 46 females diagnosed with FM by ACR criteria were randomized into two groups: group 1 – 24 patients (G1) was treated by complex therapy (patient education, stress reduction, medications, and regular aerobic exercise - an 8 weeks home training program), and group 2 – 22 control patients (G2) received only pharmacotherapy. The measured parameters were: the number of tender points, pain (visual analogue scale), Spitzer Quality of Life Index (SQLI) and Fibromyalgia Impact Questionnaire (FIQ).

Results. The mean value of FIQ was improved ($p < 0.05$) and the improvement in G1 was significantly higher than in G2 ($p < 0.01$). VAS scores for pain were reduced in all patients; this reduction was significantly higher in G1. The number of tender points for patients in G1 decreased significantly more than for those in G2.

Conclusions. Exercise programs in shorter daily schemes can lead to long-term success, especially for quality of life and clinical status. Treatment programs are most effective when they combine patient education, stress reduction, regular exercise, and medication. Background. Fibromyalgia (FM) is one of the most common soft tissue conditions characterized by pain and associated with substantial disability. After osteoarthritis, it is the most common cause for a medical consultation. An interdisciplinary medical team is the best option for assistance in FM patients.

Key words: fibromyalgia, individualized kinetic program.

Rezumat

Premize. Fibromialgia (FM) este o condiţie cronică caracterizată prin durere, redoare, senzaţie de greutate la nivel muscular, fatigabilitate, cu dizabilitate marcată. După boala artrozică, este cea mai frecventă cauză pentru consultul medical.

Obiective. Studiul randomizat controlat a fost derulat cu scopul de a evalua eficacitatea programului de recuperare, bazat pe exerciţiu fizic aerob (home-training), în asistenţa medicală a femeilor cu FM.

Metode. 46 femei diagnosticate cu FM au fost randomizate în două loturi: lot 1 (L1) – 24 paciente care au primit un program complet individualizat (măsuri educaţionale, reducerea stresului, medicaţie, home-training – program de exerciţii aerobe, derulate 8 săptămâni); lot 2 (L2) – 22 paciente care au primit doar medicaţie. Parametrii măsuraţi au fost numărul punctelor tender, durerea (scala vizual analogă - VAS), scorul Spitzer Quality of Life Index (SQLI) şi scorul scalei Fibromyalgia Impact Questionnaire (FIQ).

Rezultate. Scorul scalei FIQ s-a ameliorat pentru ambele loturi, semnificaţie statistică având modificarea pentru L1 ($p < 0.01$). Scorul scalei VAS s-a îmbunătăţit pentru toate pacientele, cu semnificaţie statistică tot pentru L1. Numărul punctelor tender pentru L1 a scăzut semnificativ, comparativ cu evoluţia celor din L2.

Concluzii. Programul cotidian de exerciţii fizice aerobe a permis o ameliorare semnificativă a parametrilor studiaţi, cu precădere pentru calitatea vieţii şi statusul clinic. Programele de terapie în FM sunt mult mai eficiente când se combină măsurile educaţionale, reducerea stresului şi kinetoterapia cu medicaţia. Echipa medicală interdisciplinară reprezintă opţiunea ideală care să performeze aceste programe de terapie la pacienta cu FM.

Cuvinte cheie: fibromialgia, program kinetic individualizat.

Received: 2016, July 20; *Accepted for publication:* 2016, August 14;
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Introduction

Fibromyalgia (FM) – a chronic idiopathic non-articular condition defined by widespread musculoskeletal pain, which is believed to involve genetic, psychological, and environmental factors (Wolfe & Rasker, 2012), is one of the most common soft tissue pain conditions associated with substantial disability seen in medical practice and the most common reason of visits to the physiatrist, after osteoarthritis. It predominantly affects women (over 80 percent) between the ages of 35 and 55. Rarely, fibromyalgia can also affect men, children, and the elderly (Di Franco et al., 2011; Wolfe et al., 2013).

Etiology is unknown and pathogenesis is unclear (Clauw & Crofford, 2003). A dysfunctional pain modulation system represents the principal explanation for central pain described in FM. There is an increased incidence of fibromyalgia among certain populations with genetic polymorphisms affecting serotonergic and catecholaminergic systems. Central sensitization is the most important central nervous system aberration in FM, with altered neurotransmitters in serum (decreased serotonin) and central system fluid (increased substance P). Nociceptive impulses reach the brain unimpeded by the usual action of the descending nociceptive inhibitory control system (Ge et al., 2011; Alonso-Blanco et al., 2011; Affaitati et al., 2011). As a consequence, patients with FM usually complain of widespread body ache with associated fatigue, anxiety, depression, restless sleep, morning stiffness and awakening feeling tired, headache, tingling/numbness, cognitive disturbance, etc. (Alonso-Blanco et al., 2011; Wolfe & Rasker, 2012).

Fibromyalgia has 2 major components: chronic widespread pain and a set of somatic symptoms. Among FM patients, these components are expressed on a continuum, with one end of the spectrum being heavily weighted toward chronic widespread pain and the other end being largely a somatic symptom disorder (Wolfe et al., 2013).

The prevalence of FM varies in different countries. It can occur independently - primary FM, or it can be associated with another disease, such as systemic lupus or rheumatoid arthritis - FM syndrome (Podell, 2007).

Fibromyalgia can be thought of as widespread myofascial pain; such patients have multiple myofascial tender points (TeP). The term tender point is also used to serve as a diagnostic marker for the diagnosis of fibromyalgia. There is now good evidence that such patients have an abnormality in their central processing of both pain sensations (hyperalgesia) and non-pain sensations (allodynia).

Fibromyalgia tender point pain may vary depending on time of day, weather, physical activity, presence of stressful situations, and often proves to be more intense after disturbed sleep; when pressed, the pain is increased without irradiation, and during palpation the node is not determined.

Tender points are extremely sensitive points on the body, painful with compression weighing four kilograms. These tender places occur symmetrically on both sides of the body (Fig. 1):

- occiput: bilateral, at the suboccipital muscle insertions;
- low cervical: bilateral, at the anterior aspects of the intertransverse spaces at CV–CVII;
- trapezius: bilateral, at the midpoint of the upper border;
- supraspinatus: bilateral, at origins, above the scapular spine near the medial border;
- second rib: bilateral, at the second costochondral junctions, just lateral to the junctions on upper surfaces;
- lateral epicondyle: bilateral, 2 cm distal to the epicondyles;
- gluteal: bilateral, in upper outer quadrants of buttocks in anterior fold of muscle;
- greater trochanter: bilateral, posterior to the trochanteric prominence;
- knee: bilateral, at the medial fat pad proximal to the joint line (Wolfe, 1990).

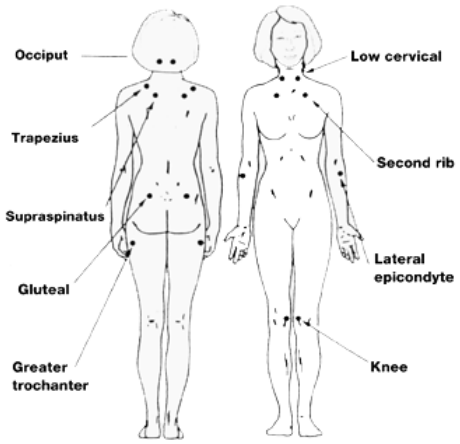

Fig. 1 – Tender points in FM patients.

Diagnosing FM can be difficult because it encompasses a very wide range of symptoms that can be confused with those of other disorders (fatigue, headache, irritable bowel syndrome, sleep disturbances, paresthesia, muscle weakness, bladder dysfunction, depression, anxiety) (Di Franco et al., 2011). FM may accompany rheumatic disorders such as rheumatoid arthritis, systemic lupus erythematosus and Sjogren's syndrome (Almodovar et al., 2010; Azevedo et al., 2010).

There is no cure for this disorder, and most patients can be expected to be symptomatic for many years, with a reduced quality of life and varied levels of psychosocial dysfunction. However, engagement in a productive lifestyle and minimization of dysfunction can often be achieved. The treatment plan should cover at least the following main problem areas: pain, sleep quality, how patients and family are coping with the distress of this chronic illness, exercise (i.e., conditioning), and whether depression and/or anxiety have developed. Although there are no guidelines for treatment, there is evidence that a multidimensional approach with patient education, cognitive behavior therapy, exercise, physical therapy, and pharmacological therapy can be effective (Chakrabarty & Zoorob, 2007). The beneficial effect of aerobic exercise in the management of FM has been reported (Vierck et al., 2001; Chakrabarty & Zoorob, 2007). A gentle program of stretching and aerobic exercise is essential to counteract the tendency for deconditioning that leads to progressive

Table I
Patient biographical data and mean values of studied parameters.

Parameters		VAS1	VAS2	FIQ1	FIQ2	SQLI1	SQLI2	NO1	NO2
G 1	24 females, age (years) limits 48.5 ± 3.002 (42-53), 15 urban/9 rural								
	Mean	6.50 #	2.73 #	62.59 #	53.86 #	4.82 *	3.18 *	14.14 #	11.64#
	SD	.859	.894	3.581	4.649	.733	.590	1.320	.921
G 2	22 females, age (years) limits 49.75 ± 4.005 (41-54), 14 urban/8 rural								
	Mean	6.45 *	3.68 *	63.55 *	56.91 *	5.82	4.83	14.14 *	12.91 *
	SD	1.011	.631	3.595	3.482	.907	.733	1.356	.658

Legend
VAS = visual analogue scale; FIQ = Fibromyalgia Impact Questionnaire;
SQLI = Spitzer Quality of Life Index, NO = number of tender points, SD = standard deviation;
1 = before the rehabilitation program, 3 = after 10 weeks, when the rehabilitation program was complete;
* correlation is significant at the 0.01 level
# correlation is significant at the 0.001 level (Pearson correlation).

dysfunction in FM patients. Before stretching, muscles should be actively warmed by gentle exercise. The European League Against Rheumatism (EULAR), in newly revised recommendations, highlights exercise as the strongest evidence-based therapy to manage fibromyalgia. These guidelines favor non-pharmacological approaches as an initial treatment, with more personalized therapies in cases of non-response that may include medications. Although evidence in the literature was poor, the committee felt that given the safety and benefit of exercise to general health, exercise should be included as a recommendation (Carville et al., 2007).

Hypothesis

Taking into consideration the previous recommendations for FM management, we evaluated in our study the efficacy of a complex rehabilitation program, based on 8 weeks home aerobic training, for reducing pain and associated symptoms and improving the quality of life in females with fibromyalgia.

Material and methods

We mention that we obtained the approval of the Ethics Committee of the University of Medicine and Pharmacy of Craiova No 19/26.02.2016 and a signed informed consent from all the subjects participating in our study. Our research was performed on 46 female patients, all diagnosed with primary fibromyalgia.

Research protocol

a) Period and place of the research

We conducted our study during the period March 2016 - July 2016 in the Rehabilitation Department of the "Filantropia" Hospital Craiova.

b) Subjects and groups

The study was a randomized controlled trial including two groups of females (G1 – study group and G2 – control group), homogeneous in terms of biographical, clinical and functional features (Table I).

The diagnosis is made on clinical ground based on patient history and physical examination. None of them had any previous disease. We took into consideration the American College of Rheumatology (ACR) criteria for FM, established in 1990 and 2010. The 1990 ACR diagnostic criteria established the extent of tenderness by palpation at 18 predetermined sites. Symptoms and co-morbid conditions were not used in the diagnosis of fibromyalgia, although their association with fibromyalgia was widely understood. In its 2010 modifications, the ACR eliminated palpation as a diagnostic criterion.

Clinicians scored the modified ACR 2010 diagnostic criteria in one of 2 ways (Table II). Both approaches score the WPI and the SS scale separately and then add the results (Ferrari & Russell, 2013).

Table II
The modified ACR 2010 diagnostic criteria for FM

	Bilateral sites (total of 14)	Unilateral sites (total of 5)
Potentially painful locations based on the Widespread Pain Index, modified ACR 2010 fibromyalgia diagnostic criteria ACR	Jaw Shoulder Upper arm Lower arm Hips Upper leg Lower leg	Neck Upper back Chest/breast Abdomen Lower back
	Widespread Pain Index scoring: The patient identifies the presence of pain in any of the 19 areas specified. Score will be between 0 and 19	
Symptom Severity scale items in the modified ACR 2010 fibromyalgia diagnostic criteria ACR	Items related to fatigue, cognitive difficulties, and sleep disturbances Fatigue Trouble thinking Waking up tired	Items related to specific symptoms Abdominal pain or cramps Depression Headache
	Items that are not scored but exclude transient illness and other conditions, such as cancer or lymphoma Symptom duration of ≥3 months The patient does not have a disorder that would otherwise explain the pain Symptom Severity scale scoring: The patient rates each item 0 (not present) to 3 (severe).	
The presence of fibromyalgia if: Widespread Pain Index ≥7 and Symptom Severity scale score ≥5, or Widespread Pain Index 3-6 and Symptom Severity scale score ≥9		

c) Tests applied

We completed an initial etiopathogenic, clinical, laboratory (laboratory screening, imaging examination - radiography and ultrasound) and functional assessment.

The *etiopathogenic* and *clinical assessment* included:

- careful patient history to determine pain parameters, accompanying symptoms (mentioned in Table II);
- general physical examination (system examination including sensory evaluation);
- musculoskeletal examination - somatoscopic exam, assessment of the range of motion and manual muscle testing, tender points (all patients had at least 12 tender

points).

During the examination, we conducted *laboratory* tests and *ultrasound* to highlight the most important tender points. For the ultrasound examination, we used a HD 11 XE Ultrasound System Philips machine, with a 12.5 MHz probe. US examination was performed after a 20-minute rest in the US evaluation room. We conducted ultrasound examination in three locations - supraspinatus, gluteal (Fig. 2a and 2b) and medial knee - and we described an abnormal muscle pattern, with scratchy hyperechoic aspects (corresponding to the taut band).

For a *functional assessment,* we used the VAS - Visual Analogue Scale (from 0 to 10, 0 = absence of pain and 10 = maximum pain score, other values between 0 and 10 are directly proportional to the intensity of pain, depending on the individual pain threshold), perceived exertion and quality of life (Spitzer scale) and values of the Fibromyalgia Impact Questionnaire (FIQ) to assess the impact of FM on activities of daily living and quality of life.

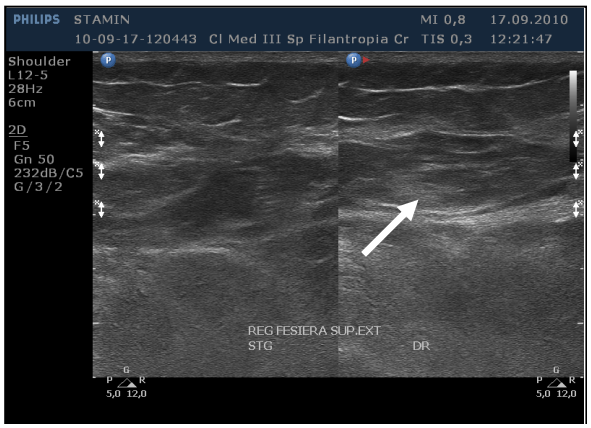

Fig. 2a – Ultrasound aspects for the gluteal area. Scratchy hyperechoic aspects in the right gluteal area (white arrow).

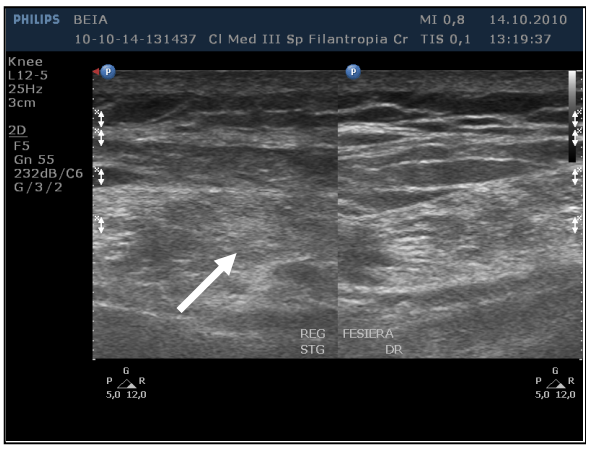

Fig. 2b – Ultrasound aspects for the gluteal area. Scratchy hyperechoic aspects in the left gluteal area (white arrow).

The SQLI (Spitzer Quality of Life Index) is a general Quality of Life index that covers five dimensions of quality of life (activity, daily living, and health, support of family and friends, and outlook). Each dimension is rated on a three-point scale (0 to 2), with a range of scores from 0 to 10. Lower scores reflect better performance (***, 2010).

The FIQ is scored in such a way that a higher score (100 is the maximum possible score) indicates a greater impact of the syndrome on the person. Each of the 10 items has a maximum possible score of 10 (Bennett, 2005).

The clinical evaluation of patients was carried out in three stages - initial (T1), after 2 weeks (T1a) - during which an in-hospital program of rehabilitation was conducted, and after a further 10 weeks (T2) in an outpatient setting. Between T1a-T2, females in G1 followed a home training program (components learned during hospitalization). Functional assessment was made at T1 and T2.

Table III
Exercise program.

Exercise	Description
The first two weeks	Daily kinetic session. 40 minutes duration. Warm-up and cool-down (stretching and active simple mobilization) - 5 min., each. Aerobic exercise (upper and lower limb exercises - Kabat diagonals, cycling) - 30 min.
Home training (8 weeks, performed only in G1 females patients) 5 sessions / week	
Warm-up 5 minutes	A warm-up should begin with gentle joint rotations, starting from your toes and working your way up the body. Perform slow, circular movements (clockwise and counter-clockwise) until all your joints - from toes, ankles, knees, and legs, to hips, trunk, neck, shoulders, elbows, wrists, fingers, and knuckles - move smoothly.
Flexibility exercises	To perform this move: facing a wall, place palms flat on the wall, one foot forward, and one foot back. Leaving heels on the floor, lean forward. As you do so, feel the pull in your calf and the Achilles tendon at the back of the ankle. Hold the position for 30 seconds. Do 5-10 repetitions. Then reverse the position of your legs and repeat.
Strength exercises	Isometric exercises – for chest, upper and lower limbs - With your arms at chest height, press palms together as hard as you can. Hold for 5 seconds; then rest for 5 seconds. Do 5 repetitions. Slowly build to holding the press for 10-15 seconds at a time. - Standing with your back against a wall and your arms at your sides, push your arms back toward the wall with your elbows straight. Hold for 5 seconds, and then rest. Do 10 repetitions. Strengthening exercises using free weights/ handheld weights, elastic bands/ for the flexor muscles of shoulders, elbows and fingers, for the hip muscles, quadriceps and leg flexors. Cycloergometer / 30 minutes, 3-4 times/week.
Cool-down 5 minutes	Stretching, analogue to flexibility exercises, only 2 minutes. Slowly jogging, 3 minutes
Recommendations Respect pain. Listen to your body. Change positions or stop whenever activities cause pain. The intensity of strengthening can be monitored by the percent of one's target heart rate while exercising (the target heart rate is calculated as (220 - age) x 0.7, age represents the number of years) When doing stretching or strengthening exercises, alternate sides often and take a short rest between repetitions. Walking for 30 minute twice daily, if you are OK.	

The healthcare objectives were painful status control and regaining quality of life.

The rehabilitation program was complex and included:

- non-pharmacological measures - educational, dietary and hygienic posture, physical (thermotherapy - paraffin and electrotherapy - magnetodiaflux, TENS, ultrasound), sedative massage and kinetic measures (five times a week for two weeks for both groups, follow-up by an 8 week home training program, only for females in G1; subjects in G2 received no home training program) (Table III);
- specific pharmacological measures - to restore the function of the descending nociceptive inhibitory system using selective gabapentinoids, and other drugs.

d) Statistical processing

The *statistical analysis* was performed using SPSS 12.0 for Windows (Statistical Package for Social Sciences). Standard statistical methods were used to compute the means and standard deviations. We used Pearson's product-moment correlation, the paired t-test and linear regression analysis to compute the correlation and association between the average values of parameters, before and after the rehabilitation program.

Results

The hypothesis that home training can effect improvements in pain, physical function, number of tender points and quality of life is substantiated by the results of our study.

Both forms of management in primary FM patients achieved significant improvements.

For pain, number of tender points and physical function, immediate effects of treatment were obtained in all patients (Table II).

There were correlations between the pre- and post-rehabilitation program mean values for all parameters, with an exception - SQLI. Quality of life presented a significant improvement only for G1. Home training patients showed a significant improvement in the mean pain score compared to the control group, and were significantly more likely to have a 58% reduction in pain from baseline. Improvements in self-reported disability were seen in the home training group (FIQ had a 15% reduction in G1) as compared to the control group (FIQ had only an 8% reduction). The number of tender points for patients in G1 decreased significantly more than for those in G2.

The results of the paired t-test revealed that parameters for G1 increased significantly compared to G2 values (Table IV).

These results were confirmed by linear regression analysis (histograms mentioned in Fig. 3a, 3b and 3c).

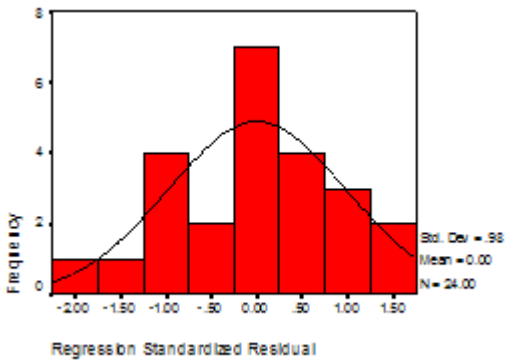

Fig. 3a – The graph frequencies for the VAS parameter (Group 1).

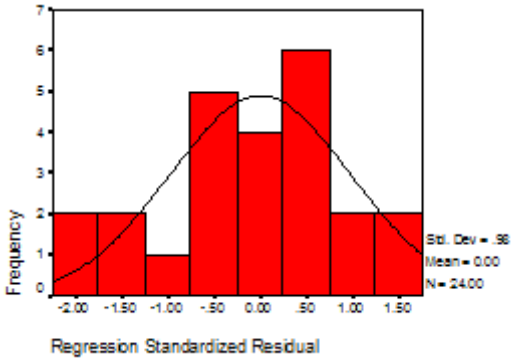

Fig. 3b – The graph frequencies for the FIQ scale (Group 1).

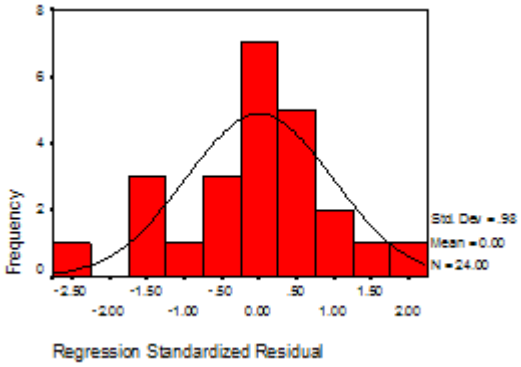

Fig. 3c – The graph frequencies for the NO parameter (Group 1).

Discussions

In our study, we performed a complex rehabilitation program and obtained good results due to a multidisciplinary team of professionals and various modalities individualized for each patient.

Table IV

Mean changes of the studied parameters.

Parameters	Group 1 Mean change (95%CI)	Group 2 Mean change (95%CI)	p * (Group 1 vs Group 2)
VAS scale (10 - 0)	2.82 (2.49 , 3.14)	3.73 (3.31 , 4.14)	< 0.01
FIQ (100 - 0)	4.68 (3.06 , 6.30)	9.68 (8.22 , 11.14)	< 0.01
SQLI (0 - 10)	-1.41 (-1.73, -1.08)	-2.64 (-3.04, -2.24)	0.05
NO	1.23 (0.8 , 1.66)	2.5 (2.07 , 2.93)	< 0.01

* significance p < 0.05; paired t-test

As the literature mentions (Cuatrecasas et al., 2007), our team included a physician, physical therapists and kinetic specialists. The FM female is a member of our team, maybe the most important, because any of the symptoms of FM can occur intermittently and in different combinations for each patient. This complete team applied a complex rehabilitation program, because it is important to treat peripheral sources of pain, such as trigger points, associated with fibromyalgia (Staud et al., 2009).

In our study we used the new ACR criteria because we must understand FM today as a systemic somatic condition based on peripheral pain elements that influence the central nervous system pathways. The emphasis now is on complex symptoms, which has important implications for treatment. So, treatment now emphasizes a graduated exercise program (highly successful in reducing the burden of dysfunction in FM patients) coupled with cognitive behavioral therapies (to address depression and catastrophic thinking and kinesiophobia that alter the work, social, and family-related behavior of the patient) (Busch et al., 2013; Bidonde et al., 2014).

In the last years, more and more studies have mentioned the important role of physical exercises in the complex management of this enigmatic disease - FM:

- Increased physical activity has a positive effect on pain perception in women with fibromyalgia (McLoughlin et al., 2011).

- Pain was the outcome variable that most commonly improved in patients who performed aerobic exercise - one of the non-pharmacological strategies advocated for patients with fibromyalgia. The major goal of this aerobic exercise is to maintain function in everyday activities. Any exercise program should include multiple dimensions: strength, aerobic (endurance) conditioning, flexibility, and balance. Exercise should be of low impact and sufficient intensity to change aerobic capacity (Chakrabarty & Zoorob, 2007).

- Aerobic exercise was associated with improvements in pain and physical function. There is some consistency with regard to aerobic and strengthening exercises, although insufficient evidence to suggest the superiority of one over the other; land and aquatic exercise appear equally effective (Busch et al., 2013; Bidonde et al., 2014).

- Exercise additionally improved sleep quality - by promoting a deep level of sleep (non-REM sleep), fatigue, global measures of improvement and quality of life. A published study that evaluated the impact of a physical therapy-based educational program on patients with FM found that the program had a positive impact on the patients' well-being (Dick et al., 2008).

- Daily aerobic and flexibility exercises may be an essential component of the fibromyalgia rehabilitation program. The goal of these exercises is for the patient to exercise safely without increased pain (Gowans et al., 2004).

- Aerobic-only training has beneficial effects on physical function and some FM symptoms. Strength-only training may improve FM symptoms, but requires further study (Busch et al., 2008a; Thomas et al., 2010).

- Recently, researchers have begun to explore the effects of a wide range of exercise techniques that extend beyond more conventional exercise training modes (e.g., low-impact aerobic training and strength training). Some of the interventions being explored are modeled on long honored holistic approaches used in China and other Asian countries (e.g., tai chi, chi gong, and yoga) or Nordic countries (e.g., Nordic walking); some arise from technologies newly applied to exercise (e.g., vibration); and others represent rethinking the prescriptive approach to physical activity (e.g., lifestyle physical activity) (Busch et al., 2011).

Taking into account that in FM patients, exercise was first recognized to have therapeutic benefits 20 years ago, we applied a complex rehabilitation program based on these exercises. Our results are in accordance with previous trials (Da Costa et al., 2005; Kingsley et al., 2005).

We consider that electrotherapy and massage can help all patients to perform better in the kinetic program. Treatment programs are most effective when they combine patient education, TENS – a useful electrotherapy method, regular exercise, and medications.

As mentioned in Table III, the kinetic program included both strength and flexibility exercises. The exercise parameters (intensity, duration and frequency) were in accordance with the literature data. The order of exercises in the kinetic program respected the set-up: warm-up, flexibility exercises, strengthening with lower resistance levels and cool-down. Our results confirm other studies about the benefits of kinetic programs in FM patients with an exercise regimen that should include the following considerations:

- start at low levels of exercise and progress slowly; progress to stretching all of the major muscle groups; include stretching as part of the exercise cool-down session;
- low-impact aerobic exercise at least 3 times weekly;
- exercise regimen: 4-5 times a week for at least 20-30 minutes each time; may take months to achieve (Jones & Liptan, 2009; Busch et al., 2008b; Nijs et al., 2013).

We considered that strength exercises have benefits on mood and physical functioning (clinical trials have confirmed the benefits of aerobic exercise and muscle strengthening on improvements in fitness, global assessment ratings, and tender-point pain thresholds), but daily aerobic and flexibility exercises are an essential component of the rehabilitation program (Gilliland, 2000).

Patients should begin with a gentle warm-up, flexibility exercises and progress to stretching all of the major muscle groups. Low-impact aerobic exercise is necessary at least 3 times weekly. Patients should always start at low levels of exercise and progress slowly. The goal is to exercise safely without increased pain. 2 patients were not able to achieve the level of exercise; we encouraged them to exercise at the highest level possible without worsening their symptoms, because recent studies have found normal energy metabolism of the muscles and no sign of muscle injuries. So, low-impact aerobic exercises can be performed and be effective in FM (Da Costa et al., 2005; Kingsley et al., 2005).

The rehabilitation program must be individualized for each patient, but the types of exercises in home training remains identical. We recommended to our patients to perform a gentle program of stretching and aerobic

exercise, which is essential to counteract the tendency for deconditioning that leads to progressive dysfunction. Most authors recommend a gradual progression from low intensity exercise, using the "start low and go slow" approach with the goal of achieving at least moderate intensity (Jones & Liptan, 2009; Busch et al., 2008b). We explained patients how and when to use kinetic modalities as part of their maintenance program, to decrease stiffness and pain.

How exercise benefits FM is unknown. Exercise activates endogenous opioid and adrenergic systems, but attenuation of experimental pain by exercise has not been shown consistently (Da Costa et al., 2005).

Taking into consideration the EULAR recommendations for FM treatment, the limitations of our study are:

- Our team did not include a medical psychologist, so none of the patients performed any type of cognitive behavioral therapy (CBT). A number of randomized, controlled trials of multidisciplinary treatment and exercise, combined with education and/or cognitive behavioral therapy, showed that patients with fibromyalgia had improvements on a 6-minute walk, with significant decreases in pain and beneficial efficacy. One randomized, controlled trial of multidisciplinary rehabilitation showed an improvement of health-related outcomes in a nonclinical, community-based setting at 15-month follow-up (Dick et al., 2008). Cognitive behavioral therapy (CBT) techniques emphasize changes in thought patterns and behaviors. It can be performed in a one-on-one or group setting, with beneficial effects achievable in as few as 10 sessions. These techniques have been used in chronic pain treatment programs that manage patients with fibromyalgia. Generally, CBT provided improvements in pain-related behaviors, coping strategies, and overall physical function in a study that reviewed the results of 13 programs using CBT (Ekici et al., 2009).

- Our studied females did not have the possibility of performing aquatic exercise; some investigators believe that aquatic exercise may be the safest and gentlest aerobic conditioning exercise available for this group. Aquatic therapy enables aerobic conditioning and also flexibility, strengthening, and stretching exercise. Aquatic exercise is well tolerated and is especially helpful for some patients (Altan et al., 2004).

- While a recent meta-analysis indicated that aquatic aerobic exercise does not produce superior results compared to similarly intense land exercise, other reviews suggest slight additional benefits in reducing pain and depression with water strengthening and aerobic exercise, and in sleep quality and mood improvement by aquatic aerobic exercise. Exercising in water may be particularly valuable for severely deconditioned individuals or for those with particularly high levels of pain or distress (Jones & Liptan, 2009; Busch et al., 2008b).

- To determine whether a specific fibromyalgia rehabilitation program is superior to non-specific musculoskeletal rehabilitation of patients with fibromyalgia in terms of work disability. The results suggest that in reducing work disability among patients with fibromyalgia, a specific multidisciplinary fibromyalgia rehabilitation program practised in Finland provides no benefit compared with non-specific multidisciplinary musculoskeletal rehabilitation. Further research is needed to develop an optimal program (or several different programs) to control the burden of work disability related to fibromyalgia (Suoyrjö et al., 2009).

Conclusions

1. Optimal treatment in FM females requires a multidisciplinary approach with a combination of medical, analgesic and antidepressant treatment, plus physiotherapy and a kinetic program, tailored according to the status of each patient - pain intensity, function, associated features such as depression, fatigue and sleep disturbance.

2. Patient preferences and available settings should guide exercise prescription.

3. Supervised home training programs, based on a shorter daily scheme, are effective and safe for the complex management of females with FM, especially for quality of life and clinical status.

4. Large, well documented, high-quality studies of exercise interventions to improve exercise adherence and optimize the benefits of exercise and physical activity in FM rehabilitation are needed.

Conflicts of interest

There are no conflicts of interest.

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